

(12) UK Patent Application (19) GB (11) 2 282 735 (13) A

(43) Date of A Publication 12.04.1995

(21) Application No 9311533.5

(22) Date of Filing 04.06.1993

(71) Applicant(s)

Mercury Personal Communications Limited

(Incorporated in the United Kingdom)

**Elstree Tower, Elstree Way, BOREHAMWOOD,
Hertfordshire, WD6 1DT, United Kingdom**

MPC 92 Limited

(Incorporated in the United Kingdom)

**Elstree Tower, Elstree Way, BOREHAMWOOD,
Hertfordshire, United Kingdom**

USW PCN Inc

(Incorporated in USA - Colorado)

**7800 East Orchard Road, Englewood,
Colorado 80111, United States of America**

(51) INT CL⁶

H04Q 7/38 , H04M 1/72 , H04Q 7/32

(52) UK CL (Edition N)

H4L LDSC L1H10 L1H3

(56) Documents Cited

GB 2269723 A

GB 2249693 A

GB 2225512 A

GB 2162404 A

EP 0563898 A2

US 5210785 A

(58) Field of Search

UK CL (Edition M) H4K KY4D KY4D14 KY4D14R

KY4M, H4L LDSD LDSF LDSX LECTE LECX

INT CL⁵ H04M 1/72 , H04Q 7/04

Online databases:WPI

(72) Inventor(s)

Peter Alan Ramsdale

(74) Agent and/or Address for Service

Guy Selby-Lowndes

**Alexander Ramage Associates, 20 High Street,
WOKING, Surrey, GU21 1BW, United Kingdom**

(54) **Autorouting system for mobile telephones**

(57) A telephone system in which the user carries a handset which operates both as a mobile telephone when away from a home base station through a cellular radio network, and the handset automatically initiates operation of a land based line system when located at or near to a home base station. The initiation of the land base station may alternatively be set up by a unit separate from the handset and carried by the user or when the handset operates as a mobile telephone it transmits low power narrow bandwidth telemetry signals adapted to identify the handset. The homebase station may include reception means for the low power narrow bandwidth telemetry signals, signal interpretation means and signal response means. The interpretation means provides an output signal when the identifying signal from the handset, signal interpretation means and signal response means. In a second operating mode incoming calls to the handset may be routed through the PSTN system. The identifying signal may be an infra-red or an ultrasonic signal. The land base station can transmit low power identity signals so that when a handset receives the identity signals it transmits a confirmation signal and the land base station switches the handset signals to the second operating mode. In one embodiment the operation of the land based line system is initiated when the handset is detected by its presence in a charging station. In an alternative embodiment the operation of the land based line system is initiated when the handset is identified by recognition of the code signals used for calling and maintaining affiliation with a cellular radio network.

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AUTOROUTING SYSTEM FOR MOBILE TELEPHONES

This invention relates to an autorouting system for mobile
telephones and particularly a system allowing mobile use on
5 a cellular system and static or small area use on a
conventional telephone network.

Personal telephone systems exist which allow the user to
operate a handset across large areas of a country by means
10 of a link with a cellular radio network. The comparatively
high costs of running such cellular radio networks
and the added utility of mobility are passed on to the user
who pays higher charges than when using a public switched
telephone network (PSTN) which is primarily based on
15 landlines and directional radio links and simple switched
exchanges. For this reason when a telephone user is at a
static location in an office or at home it is preferred to
use the PSTN system. The conventional solution is to have
two telephone handsets; one for mobile use to operate in
20 conjunction with a cellular radio network and a static base
telephone connected to the PSTN system. The handset of
the latter telephone may be connected by wire to the base
unit or by a short range, e.g. 100 m. radio link when it is
usually referred to as a cordless telephone.

25 In order that the need for two telephones could be elimin-
ated it has been suggested that handsets should be designed
which are adapted to operate on both a cellular radio
network and on the PSTN. Such proposed dual mode handsets
30 must contain facilities to enable them to operate on both
systems. The changeover from one system to the other
takes place automatically when the user enters or leaves
the home base station area, i.e. home or office. This
requires incoming calls to be forwarded to the appropriate
35 network. An auto dialler can be used to alert the network

- switches such that routing addresses are changed for inbound calls. For this system to operate the home base station must include a radio transmitter which communicates with the mobile telephone when it is at the home base station. The inclusion of such a transmitter in the home base station involves considerable cost as the transmitter must be capable of communicating the complete range of speech frequencies in analogue or digital form together with signals to locate the handset and set up telephone calls. While further complication arises from frequency planning to prevent interference between separate home base station systems or circuitry to avoid automatically such problems (dynamic channel allocation). Furthermore all the home base station telephones are activated when the mobile telephone is at the home base station. An advantage of this scheme is that the user receives calls made to his personal (mobile) number on his home system when this is more appropriate.
- 20 According to the present invention there is provided a telephone system in which the user carries a handset which operates both as a mobile telephone when away from a home base station through a cellular radio network and which automatically initiates operation of a land based line system when located at or near to a home base station. In one embodiment the initiation of the home base station can be set up by a unit separate from the handset and carried by the user.
- 30 Again this enables the user to be contactable always by a single personal number. This can include the extension of use of this personal number to areas outside the geographic coverage area of the cellular radio network.
- 35 In a preferred embodiment the handset operates as a

conventional mobile telephone receiving signals from and transmitting signals into a cellular radio network. Apart from the facility to transmit data and analogue signals for call connection, identification and traffic purposes in its
5 cellular mode, the handset also transmits low power narrow bandwidth telemetry signals which identify the user. Static locations, e.g. homes or offices, have installed home base station units which are connected to the PSTN system and which have radio reception means adapted to
10 receive the handset telemetry signals and interpret and respond to them. When the user comes into close proximity with a home base station the identity signals are received and, if accepted by the home base station, act as a key to switch the handset signals to a second operating mode in
15 which incoming calls calling the number of the mobile telephone user are routed through the PSTN system without the need for the user to take any action. The handset will continue to operate as a mobile telephone within the office or home for making outgoing calls. However
20 incoming calls, regardless of origin, are routed to the home base station through the PSTN system.

As this system utilises low power, narrow bandwidth telemetry signals which can be sent as non-continuous short
25 bursts only, interference and frequency planning difficulties are minimal.

In any of the embodiments the identity signal need not be a radio signal but may be an infra red signal or an ultra-
30 sonic signal possibly restricting the catchment area to a single room. By choice of radio frequency power level and modulation method the catchment area of a radio based system can be varied.

35 Using any form of cordless link however has the advantage

that mobile telephones fitted to motor vehicles may operate the call rerouting system when the vehicle is parked close to the home base station or in an associated garage.

- 5 The invention permits the user to receive calls on his single personal number from whichever is the most appropriate network, cellular radio or PSTN, at a given time without the need for the complexity of a dual mode handset or cost of a fully functional home base station.

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In an alternative embodiment low power identity signals may be transmitted by the home base station unit. When the portable handset comes within reception area of these signals an identity signal is transmitted to the home base station unit confirming the handset's presence within the home base station unit's catchment area and its identity. As described previously the home base station switches the handset signals into the PSTN system without user intervention.

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In yet a further embodiment the change in routing of incoming calls may be initiated by detection of the presence of the mobile handset in a specific location such as a charging station. The detection of the handset,

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which may take place in known manner by means of direct electrical connection, optical, magnetic or other detection devices, initiates an interrogation routine to confirm the identity of the user before routing incoming calls into the PSTN system.

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In a further embodiment the identity of the handset can be established in known manner by means of recognising features of the code generating and detecting system used for calling and maintaining affiliation to the cellular

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radio network. Alternatively a separate identity code may

be transmitted for activating the mode change when the handset enters the catchment area of a home base station unit. It will be clear that in certain cases it may be advantageous for a single handset to be capable of changing
5 to a mode of operation which uses the PSTN system at a number of locations. for instance at different office locations of an organisation or company.

When operating the dual mode system in a home or office
10 environment as a result of the mobile handset keying the routing control system all incoming calls will be routed through the PSTN system to the home base station unit. Such calls will cause all static telephones connected to the system at the home base station to ring.

15 The change of mode allowing the mobile handset to use the PSTN system when at a home base station will primarily affect incoming calls. As part of the mode changing operation the home base station will send signals to the
20 central operating system so that any calls for the handset number. whether from mobile telephones or PSTN sources. will be directed through the PSTN system to the home base station and not through the cellular radio network. The mobile unit however remains functional as a cellular radio
25 network telephone and outgoing calls may be made in the usual manner regardless of incoming calls being received by the home base station.

The home base station unit may also comprise one or more
30 static telephone handsets. When outside calls are made to the number of the mobile telephone the presence of the handset at the home base station will ensure that one of the static telephones can be used to receive the call. A degree of local mobility is possible at the home base
35 station if one of the telephone handsets is a cordless telephone.

A further service is possible which does not use a cellular telephone at all. The user carries the telemetry unit only. Whenever the user is near his home, or other telephones associated with the base station, they would be

5 activated to become his personal telephone. Such a telemetry unit can be integrated with other devices carried by the user such as a DTMF tone generator. This can be used to actuate call forwarding at any telephone while those with the home base unit would be activated automatically.

10 Alternatively the telemetry unit could be integrated with a subscriber identity module (SIM) card. This is a so-called 'smart card' used to enable some cellular telephones for a specific user.

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CLAIMS

1. A telephone system in which the user carries a handset which operates both as a mobile telephone when away from a home base station through a cellular radio network and which automatically initiates operation of a land based telephone line system when located at or near to a home base station.
2. The telephone system as claimed in claim 1, characterised in that when the handset operates as a mobile telephone it separately transmits low power narrow bandwidth radio frequency telemetry signals, either continuously or periodically, adapted to identify the handset.
3. The telephone system as claimed in claim 1, characterised in that the initiation of the land base station is set up by a unit separate from the handset and carried by the user which initiates a radio frequency identifying signal either continuously or periodically.
4. The telephone system as claimed in claim 2 or claim 3, characterised in that the homebase station includes reception means for the low power narrow bandwidth telemetry signals, signal interpretation means and signal response means.
5. The telephone system as claimed in claim 4, characterised in that the interpretation means provides an output signal when the identifying signal from the handset is recognised and the response means switches incoming calls to the handset to a second operating mode.

6. The telephone system as claimed in claim 5, characterised in that in the second operating mode incoming calls to the handset are routed through the PSTN or other land based line system.

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7. The telephone system as claimed in claim 1, characterised in that the land base station transmits low power radio frequency identity signals either continuously or periodically and in that when a handset receives the
10 identity signals it transmits a confirmation signal and the land base station switches the incoming calls to the handset to a second operating mode.

8. The telephone system as claimed in any of the claims 2
15 to 7, characterised in that the identifying signal is an infra-red or ultrasonic signal.

9. The telephone system as claimed in claim 1, characterised in that the operation of the land based line system is
20 initiated when the handset is detected by its presence in a charging station.

10. The telephone system as claimed in claim 1, characterised in that the operation of the land based line system is
25 initiated when the handset is identified by recognition of the code signals used for calling and maintaining affiliation with a cellular radio network.

11. Telephone systems as claimed in claim 1 and as herein
30 described.

Patents Act 1977**Examiner's report to the Comptroller under Section 17
(The Search report)**Application number
GB 9311533.5**Relevant Technical Fields**(i) UK Cl (Ed.M) H4K KY4D, KY4D14, KY4D14R, KY4M;
H4L LDSD, LDSF, LDSX, LECTE, LECX

(ii) Int Cl (Ed.5) H04M 1/72; H04Q 7/04

Search Examiner
M J BILLINGDate of completion of Search
26 AUGUST 1994**Databases (see below)**

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASE: WPI

Documents considered relevant
following a search in respect of
Claims :-
1-10**Categories of documents**

- X:** Document indicating lack of novelty or of inventive step. **P:** Document published on or after the declared priority date but before the filing date of the present application.
- Y:** Document indicating lack of inventive step if combined with one or more other documents of the same category. **E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.
- A:** Document indicating technological background and/or state of the art. **&:** Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X,E	GB 2269723 A	(SAGEM) eg see page 15 line 6 - page 16 line 25 published 16 February 1994	1 at least
X	GB 2249693 A	(NORTHERN TELECOM) eg see Abstract, page 15 line 7 - page 16 line 14	1 at least
X	GB 2225512 A	(MOTOROLA) eg see Abstract; Figures 5,6	1 at least
X	GB 2162404 A	(RACAL) eg see page 2 line 11 - page 3 line 65	1 at least
X,E	EP 0563898 A2	(CASIO) eg see column 6 line 46 - column 9 line 38, column 18 line 15 - column 19 line 52 published 6 October 1993	1 at least
X	US 5210785	(CANON) eg see column 3 line 9 - column 6 line 8	1 at least

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).